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Notes on Relation Between Abnormality and Insect Attacks in Western Yellow and Jeffrey Pine Stands.

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A very prevalent common belief seems to exist among technical foresters that insects attacking and killing trees select individuals which are weakened by attacks of mistletoe and fungi or are injured in some other manner which reduces the vitality of the tree. Field experience, however, suggests a doubt as to the accuracy of this belief which does not seem to be supported by carefully taken and tabulated data.

The figures in this article pertain to 1656 trees attacked by the killing bark beetles of Pinus ponderosa and Pinus jeffreyi. These are known as the Western Pine Beetle (Dendroctonus brevicomis, Lec.) and the Jeffrey Pine Beetle (Dendroctonus jeffrei, Hopk.). Each tree has been cut and peeled and the bark and limbs burned to destroy the beetles infesting them. The area upon which these trees were cut and examined included the entire watershed of the Susan River in the Lassen National Forest in California.

Before submitting the tabulated data it seems advisable to make a few comments on the injurious factors, mistletoe, decay and lightning. The criticism might justly be made that we do not know to what extent these factors exist in the remaining stand not attacked by the beetle. An extensive survey of the area, however, has convinced the writer that only a proportional amount of mistletoe trees had been attacked and killed, and an examination of mill cuts on representative areas also indicates that the trees with decay or heart rot are likewise proportional.

The reverse, however, is true of trees recently struck by lightning. If there is epidemic infestation within the area every lightning struck tree becomes infested. If, however, the infestation is very slight on an area, lightning struck trees often escape being attacked. Healed lightning scars of trees truck many years ago are quite frequent in some parts of the forests. Trees struck by lightning seldom die from the shock unless badly shattered. It may therefore be said that these destroying beetles prefer and select trees struck by lightning, but do not particularly choose trees weakened by attacks of mistletoe or fungi, as many of the latter

trees remain in the forest unattacked while over 50% of healthy trees are attacked. If in epidemics these destroying bark beetles did select all the weak trees first, they could be used as a factor in sanitation, checked by man when the weak trees had been destroyed and only the healthy trees were left.

The area upon which the data were taken sustained in the years 1916 and 1917 a loss of over four million fee feet of timber due entirely to the above mentioned species of bark beetles, not withstanding the fact that the loss in 1917 was greatly lessened by the control work of 1916. In the following tables it will be noticed that the percentages for mistletoe and decay are fairly constant for the two years. Necessarily lightning trees would vary according to the prevalence of lightning storms and the number of trees struck during a particular season.

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TABLE 1.

Species	Year	Mistle-toe	Without Mistletoe	% with Mistletoe	Total Trees	Notes.
Pinus ponderosa	1916	65	344	15.6%	409	12 with decay & two with lightning
	1917	31	184	14.4%	215	3 with decay.
Totals		96	528	15.4%	624	

TABLE 2.

Species	Year	Decay	Without Decay	% with Decay	Total Trees	Notes.
Pinus ponderosa	1916	45	364	11%	409	12 with mistletoe & 2 with lightning.
	1917	23	192	10.7%	215	3 with mistletoe
Totals		68	556	10.9%	624	

TABLE 3.

Species	Year	Light-ning	Without Lightning	% with Lightning	Total Trees	Notes.
Pinus ponderosa	1916	16	393	3.9%	409	2 with mistletoe and 2 with decay
	1917	4	211	1.9%	215	
Totals		20	604	3.2%	624	

TABLE 4.

Species	Year	Mistle-Toe	Without Mistletoe	% with Mistletoe	Total	Notes.
Pinus jeffreyi	1916	249	591	29.6%	840	20 with decay & 1 with lightning.
	1917	29	163	15.1%	192	3 with lightning.
Totals		278	754	26.9	1032	

TABLE 5.

Species	Year	Decay	Without Decay	% with Decay	Total Trees	Notes.
Pinus jeffreyi	1916	87	753	10.2	840	20 with mistletoe
	1917	16	176	8.5	192	
Totals		103	929	10%	1032	

TABLE 6.

Species	Year	Light-ning	Without Lightning	% with Light-ning	Total Trees	Notes.
Pinus jeffreyi	1916	9	831	1.1%	840	1 mistletoe
	1917	6	186	3.1%	192	3 mistletoe
Totals		15	1017	1.5%	1032	

TABLE 7.

SUMMARY.

Tree Species	Trees weakened.	Trees apparently healthy.	% weakened.	Total trees cut.
P. ponderosa	165	459	23.2%	624
P. jeffrey	372	660	36.%	1032
	537	1119	32.4%	1656

The only other visible factor which might cause a decrease in vitality below the normal or healthy tree, would be old firescars. It is reasonable to suppose that as many of these firescars are small, the majority of them would not reduce the vitality of the tree. In order, however, to eliminate every possible factor I shall further deduct all fire scarred trees. These number 122 Yellow pines and 162 Jeffrey pines, or a total of 284 trees from the 1119 apparently healthy. This leaves a balance of 835 trees which were apparently healthy or as healthy as any tree in the forest, each having a good crown and a full complement of foliage, or 50.4% of the entire number of 1656 infested trees. As the infestation was pretty evenly distributed over the whole area and as numerous and quite evidently weak trees are still left on the area the conception that tree killing bark beetles show a preference for weakened trees appears, at least for the area examined, not to be supported by actual facts. This, however, is not an isolated case, as the above figures can be duplicated by data collected on several other insect control areas in California.